

Walter Faxon.

ANNUAL REPORT

OF THE

TRUSTEES

OF THE

MUSEUM OF COMPARATIVE ZOOLOGY,

AT HARVARD COLLEGE, IN CAMBRIDGE,

TOGETHER WITH

THE REPORT OF THE DIRECTOR

FOR

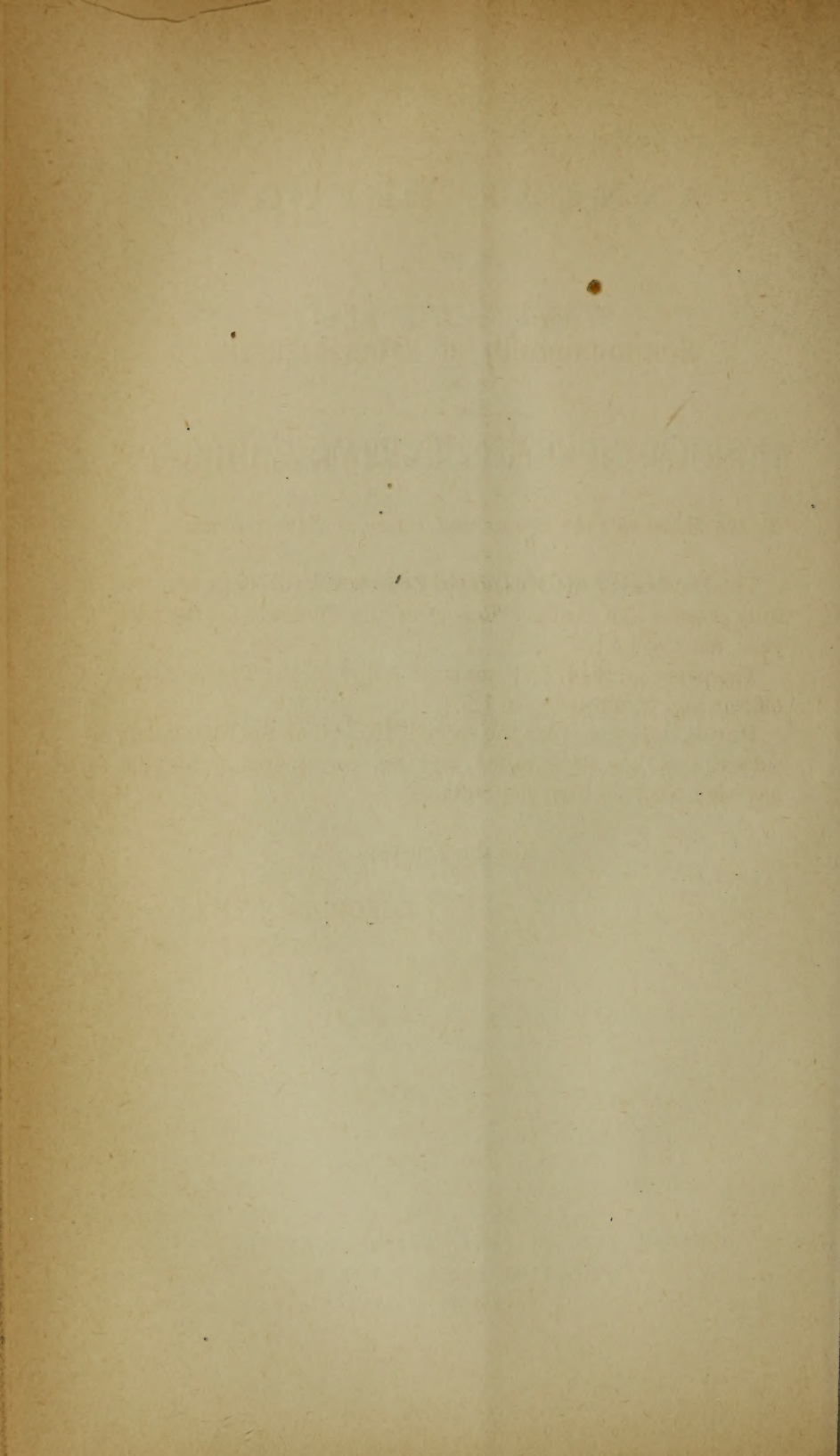
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1870.



Commonwealth of Massachusetts.

BOSTON, January 26, 1870.

To the Honorable the Senate and House of Representatives.

The Trustees of the Museum of Comparative Zoölogy respectfully present the Annual Report of the Director for the past year, marked [A].

The paper marked [B] contains a list of the Trustees, the officers and committees for 1870.

During the past year the second \$25,000 of the conditional subscription has been raised, and the corresponding \$25,000 has been received from the State.

For the Trustees,

THEODORE LYMAN,
Secretary pro tem.

[A.]

REPORT OF THE DIRECTOR
OF THE
MUSEUM OF COMPARATIVE ZOÖLOGY,
FOR THE YEAR 1869.

IT is now ten years since, in 1859, the Museum of Comparative Zoölogy in Cambridge was organized. We have closed our first decade, and it seems, therefore, appropriate to review the work thus far accomplished and to see where it has brought us. Beginning with very small means and scientific materials, the basis for which was chiefly the Gray fund and my private collection of specimens, hardly known at all abroad and attracting but little notice in those days at home, the Cambridge Museum occupies now a very honorable place among the prominent scientific institutions of the world. It is in no spirit of egotism that I, as Director of this establishment, speak thus of its present standing. But it is no more than fair that the legislature of Massachusetts and the individuals who have so generously sustained this undertaking should know that their liberality has not been misapplied. Familiar as I am with the history of museums, it is an astonishment and a gratification to me to find that in this short time we have attained a position which brings us into the most intimate relations with the first museums of Europe ; we have a system of exchanges with like establishments over the whole world ; while the activity of original research in our institution, and its well-sustained publications, the possibility of which we owe to the liberality of the legislature, make it one of the

acknowledged centres of scientific progress. Nor is this all. Men of high scientific standing in Europe are tempted to come and join us on the moderate salaries we are able to give, for the pleasure of working up collections in some respects more complete and more interesting to the student than any now existing. In this connection, I may add that I have secured, for a couple of years at least, the assistance of Doctor Steindachner, of Vienna, one of the first ichthyologists now living, to aid me in putting up our immense collection of fishes. Dr. Maack is another accession of the past year. He is making rapid progress in bringing our collection of fossil Vertebrates into order, in anticipation of the time when an increase of our building will enable us to display it to the public.

When our building was first put up, ten years ago, it was thought sufficient, and I myself then deemed it large enough, for the needs of the establishment. But so great has been the increase of our collections since that time that at this moment the Museum overflows from garret to cellar; there is hardly room to move between the boxes, barrels and temporary shelves put up for the accommodation of specimens, and with the utmost economy of space it is almost impossible for our daily increasing number of workers to proceed with their labors. Indeed, many most important and interesting features of the Museum must be ignored till we have more room; as, for instance, the large and perfectly unique collection of palms and tree ferns, with flowers and fruits preserved in alcohol, one of the most valuable results of the Thayer Expedition. This last collection has great importance in a museum like ours, intended especially for students and for educational purposes, because it illustrates, as no diagram can do, the ancient vegetation of our earth, and has a direct bearing on its geological and palæontological history. I had engaged Mr. Lesquereux, one of the few men in this country capable of arranging such a collection systematically, with reference both to its botanical and palæontological value; but on seeing the collection he declined to unpack it, before there was space enough to spread the whole out without danger of mixing or confounding the specimens; saying that as such a collection would probably not be made again, we should be unwise to endanger it by our impatience to display it and bring it into use.

The same is true of many other collections of equal interest in our Museum; as, for example, that of the fishes from the Amazons and other parts of Brazil. But a very small portion of the rich harvest from the Thayer Expedition has as yet been seen by the public. Indeed, since its foundation the collections of the Museum have been immensely enlarged by exchanges, which have been a fertile source of increase, as well as by gifts and by purchase, the latter mainly made from the Gray fund. In the past year this fund, which was our first important endowment, has been chiefly spent in the purchase of a collection of fossil insects from Solenhofen, and of a collection of fishes from the West Indies, bought of Professor Poey.

While I am preparing this Report, the welcome intelligence is brought me by Mr. Lyman, treasurer of the Museum, that the second instalment of the subscription from private individuals, upon which is dependent the contribution of a like sum by the Legislature, is just completed. This gives us \$50,000 for immediate use, and will enable us to proceed at once with our building; so that I trust in the course of another year we shall be able to show to the public, in tangible shape, the verification of the above statements.

Its rapid growth may give rise to the idea that the Museum has had large means at its command. It has certainly owed much to the generosity both of the State and of individuals; but I claim that its results, as compared with those of other institutions, are in more than due proportion to the money expended. The income of the British Museum and the Jardin des Plantes, for the maintenance of the departments included in our plan, is more than ten times that of the Museum of Comparative Zoölogy. I am not, of course, comparing equal things in naming these institutions together; but I maintain that while the two former are on so much larger scale, ours is in certain departments, such as corals and fishes, superior to both, and that in activity of research and publication it yields to neither, while the increase of its collections since its existence, and the prominence it has attained among other museums is such as no like establishment has reached in the same time and with the same means. I find myself constantly in a dilemma, between the modesty befitting a director and the desire, which is also a duty, of showing those who have supported this insti-

tution how their money has been spent and what ends their liberality has served. In thus extolling the institution I speak also more for others than myself, for I have owed in great degree to the corps of assistants working with me the possibility of accomplishing my aims. The organization must of course be the work of the Director ; but for the energetic and intelligent carrying out of the scheme I have to thank the gentlemen working with me either as assistants upon very moderate salaries or as friends of the institution who give their work without any remuneration whatever. Among the latter our thanks are especially due to Mr. Lyman, who takes upon himself the troublesome office of treasurer, and manages the funds of the Museum in a way to make them available to the last dollar.

The chief work done this year has been the mounting and labelling of specimens for exhibition, in order that whenever the new building should be ready we might open it to the public without delay. The special reports appended below, will show how much has been done in this way in each department. I may state in general that in the entomological department, under direction of Dr. Hagen, much progress has been made in arranging the collections, both for exhibition and exchange, and also for the benefit of special students. Besides the general systematic collections, the biological, physiological and palæontological collections are already well advanced, as well as one showing the metamorphoses and different stages of growth of the species. The palæontological collection of Insects has been enriched by a valuable collection purchased from Dr. Kranz, in Bonn, Prussia, to be paid out of the Gray fund, while we owe to Professor Ratzeburg, in Berlin, a collection of insects destructive to vegetation, and a valuable work on the same subject. The entomological department of our library has been increased by the library of the late Dr. Zimmerman of South Carolina. In connection with this subject I would draw attention to the arrangement announced in Dr. Hagen's report for furnishing students with cheap and excellent microscopes from Europe.

By a reference to the report of Mr. Anthony, it will be seen, that while the system of exchanges, in the department of Conchology, has been kept up with regularity, so that we are constantly in receipt of such specimens as are still wanting in our large collection, the chief labor has been in mounting and

putting up specimens. There are at this moment 26,250 tablets of shells, representing 67,749 specimens, a large proportion of which, for want of room, are hidden in drawers and cases. I cannot sufficiently praise the perseverance and industry of Mr. Anthony, who is indefatigable in his care of this collection.

Mr. Allen's report shows a considerable increase in the collection of Mammalia and Birds, during the past year, but we were obliged to be cautious in admitting larger additions in this department, on account of our deficiency of room. With our present prospect of increased accommodation any difficulty on this score is removed for the future. The most important addition to the mammalia has been a very valuable collection of seals and walrus from Alaska, which we owe to Mr. Charles Bryant, of Fairhaven. In birds the chief additions are from Florida and the West Indies. In the systematic arrangement of these collections, much has been accomplished, and the record of the year, in this respect, is very satisfactory.

I refer to the reports of Mr. Shaler and Mr. Perry for an account of the fossil collections.

Mr. Shaler's report is especially interesting from the notice of excavations, undertaken partly at his own expense, partly through the generosity of Mr. James M. Barnard, the constant friend of the Museum, in Big-Bone Lick. These excavations have been already very productive and promise larger results in the future, the more so from the facilities afforded us by the liberality of Mr. McLaughlin, owner of the ground, who has been exceedingly kind, and seems to take a cordial interest in the results of our efforts. Mr. Shaler has continued his courses of instruction, both in the lecture room and in the field. He has added to his University courses of lectures, those given as Professor of Palæontology, in the Mining School, also delivered in the hall of the Museum. His appointment to this new post leaves his former connection with the Museum unchanged, and indeed, widens the sphere of usefulness of our institution, inasmuch as it now affords the means of special study to a class of students who thus far have derived little or no benefit from it.

It will be seen that under the care of Mr. Perry great progress has been made in arranging and cataloguing the tertiary fossils and the fossil Corals, while numerous special collections

for exchange have been prepared. Beside his unremitting and most efficient work, in his own department, Mr. Perry has given two courses of lectures, during the academic year. He has presented to the Museum a valuable collection of fossils, the result of fifteen years' work among the rocks of New England. Our fossil collections have also been enriched by a large collection of fossil Echinoderms from M. Cotteau, the more valuable for being labelled by that distinguished palæontologist.

The report of Dr. Maack on fossil Vertebrates, simple and short as it is, speaks for itself. It will be seen how efficient and able an assistant we have secured in him, and how greatly such aid was needed in the Museum.

Dr. Stähli has been engaged in arranging and cataloguing the library, which is becoming, chiefly by exchange, every year more valuable. As this Report goes to press I have received an invoice announcing five series of costly German scientific periodicals, presented by Prof. P. Merian, in behalf of the University of Basle.

The class of Reptiles is the only one which has received little attention during the past year. For the class of Fishes a great deal has been done in the way of sorting and arranging specimens according either to their systematic or their faunal relations. In this work I have been chiefly aided by Messrs. Bliss and Lockwood, students in the Scientific School, and for a time also by Mr. Martin and Dr. Stähli. But the amount of materials on hand is so large that the progress appears slow. In the arrangement of the Mollusks preserved in alcohol, I have received much aid from Mr. Blake, also a student in the Museum.

Mr. Paul Roetter, now permanently attached to the Museum as artist, has been most industrious in drawing illustrations of various kinds, but chiefly of fishes and Crustacea for the forthcoming publications of the Museum. Among these a monograph of the North American Astacidæ, by Dr. Hagen, will soon be ready for distribution.

One of the most valuable accessions ever received at the Museum consists of collections brought up from deep-sea soundings, made by a party of the Coast Survey, according to the directions of the Superintendent, Professor Peirce. These large collections contain the various kinds of marine animals,

secured by the dredge and otherwise, along the coast of Florida, from the shore to the deepest waters of the Gulf of Mexico. These specimens, collected chiefly by M. de Pourtales and during the last cruise in part by myself, are now undergoing careful examination by various investigators, and it is hoped that the results thus secured will be shortly published in a fitting manner.

M. de Pourtales is now engaged upon a monographic description of the corals, some of which he has described in our Bulletin. Alexander Agassiz and Theodore Lyman have worked up the Echinoderms, and a summary of their investigations has also been published in our Bulletin, while the Crustacea and Mollusks have been entrusted to Dr. Stimpson, for description, and the Sponges to Professor Oscar Smith in Gratz, and the Annelids to Professor Ehlers in Erlangen. I have also published in the Bulletin a short report of these deep-sea dredgings and their general scientific results.

I should not omit to mention that we have had a number of young ladies as assistants in the Museum this year, and have found them very efficient and faithful workers. For several years, I have, at different times, accepted the services of ladies in the Museum, some as voluntary, others as paid assistants. I have been the more ready to do this, thinking that I might assist in securing for women a greater variety of employments, the need of which is now so much felt. With us the experiment has succeeded admirably. A large part of the work to be done in a museum is particularly appropriate for women, and I only regret that a necessary economy forces me to diminish the number of young ladies thus employed. Both as students and as assistants they have shown an apt intelligence, with great fidelity and conscientiousness in the performance of their work.

It is my pleasant duty, in closing this Report, to announce that a scholarship has been founded this year, at the Museum, endowed by the Boston Society of Natural History, and called the Humboldt Scholarship. That Society devoted the whole result of the festival, by which they celebrated the centennial anniversary of Humboldt, to this purpose, thus binding by a new tie, these two scientific institutions, and permanently connecting both with the memory of that great man.

With the new building a new chapter opens in the history of

the Museum. Hitherto the public has accepted to a great degree on my assurance alone, without ocular proof, the immense wealth of our collections. The projected additions to the building once completed however, the mounted specimens and those otherwise prepared for exhibition fairly laid out, it will then be possible for any intelligent visitor to judge not only of the riches of the Museum, but to trace also the plan of its organization and the ideas I have attempted to illustrate in its general arrangement. But to preclude possible disappointment, I would add that while I hope no true lover of nature will ever come to our Museum hereafter without learning something, while he has at the same time his eye and taste gratified, yet the object of our institution is not that of popular exhibition. Its highest aims are the advancement of science by original research, the opening of practical instruction in Natural History on the largest and most liberal terms to students, and as including and comprehending all lesser views, the attempt to illustrate so far as the present state of our knowledge renders it possible, the plan of creation as shown in the history of organized beings from the dawn of life on earth till now.

I herewith submit the special reports of Messrs. J. A. Allen, H. A. Hagen, J. G. Anthony, N. S. Shaler, J. B. Perry, G. A. Maack and T. R. Stähli, officers of the Museum in charge of special departments, as parts of my own. In absence of Mr. Alex. Agassiz, who is travelling in Europe on account of his health, I have no special report to present concerning the department of the Radiates.

L. AGASSIZ.

Report on the Mammals, by J. A. ALLEN.

As mentioned in the last Report, all the skins of the Mammals were catalogued and systematically arranged last year. Early in the present year the condition of the entire alcoholic collection was examined, and spirits added where there had been a loss by evaporation or leakage. A few weeks since the systematic arrangement of this collection was commenced, and several hundred specimens of those uncatalogued have been

catalogued. Many hundreds more still remain to be recorded. It is hoped that during the coming year the cataloguing will be completed, and the whole collection systematically arranged. As the work progresses, the specimens are removed from the barrels in which they are now stored, to glass jars and stone crocks, these having been found to be in the end the more economical and convenient. Each species is generally placed in a separate jar, suited to its size and to the number of specimens of it contained in the collection. When the number of specimens of any species is very great, as is the case in some of our smaller native species, the specimens are separated into several jars, and arranged according to the localities at which they were collected. This revision of the collection is revealing the fact that there are a large number of specimens that may be spared for skeletons, and the preparation of them has already been commenced. Although this work requires much time, if it is carried steadily forward, as it is now proposed by the Director that it shall be, the osteological collection in the Museum, already large, will soon be much increased from this source. In accordance with instructions received from the Director, it is proposed to prepare a large series of skeletons of those species for which there is ample material, for the purpose of determining within what limits individuals of the same species may present variations in their osseous structure. This will give a basis for determining the value of specific identifications when made from single bones, to which unsatisfactory data palæontologists are frequently restricted. A comparison of the young of different species is also to be made, in order to ascertain at what age they take on their specific, generic and family characters.

The additions to the collection of Mammals, during the past year, have been small. This is mainly due to the fact that at present, at least so far as skins are concerned, there is no longer room for their proper storage; perhaps in part to the general necessity for limited expenditures. One invoice of especial value, however, has been received, through the kindness of Captain Charles Bryant. This lot is from the Islands of St. George and St. Paul, Alaska, and embraces a skull, a complete skeleton and a fresh skin of the Walrus (*Trichechus rosmarus* Auct.), fresh skins and complete skeletons of two adult speci-

mens of the Northern Sea Bear (*Otaria Stelleri* Auct.), and skins and complete skeletons of two adult male specimens of the Northern Fur Seal (*Callorhinus ursinus* Gray), and also skins and complete skeletons of two adult females, and skins and skeletons of two four months old specimens of the same species. The skins being in good condition for mounting were immediately sent to Mr. S. Jillson to be stuffed.

The extent of the collection of Mammals already gathered may, in general terms, be thus stated. The skins alone, which comprise less than one-fifth of the whole number of specimens, represent about one-half of the described North American species; about one-third of the South American, European and Australian; one-tenth of the Asiatic, and one-half of the African. In the alcoholic collection, which must number about three thousand specimens, are represented all the leading groups, besides many species of which the Museum has no dry specimens. This evidently forms a satisfactory beginning, when it is remembered that the increase of this department, as of that of Ornithology, has not as yet received very special attention.

Below are enumerated the additions made to this department since the last report.

By Donation.

AGASSIZ, ALEXANDER. 3 boxes of stumps of trees felled by beavers, and sticks from beaver-dams, from Calumet, Michigan.

AGASSIZ, Professor LOUIS. 14 specimens, 4 species, in alcohol, from Jamaica Plain.

ALLEN, J. A. 1 *Lepus americanus*, in peculiar pelage, fresh, from Massachusetts.

ALLEN, J. A. and Rev. THOMAS MARCY. (*Florida Expedition*.) 30 specimens, 10 species, skins; 14 specimens, 6 species, in alcohol; 24 specimens, 10 species, skulls and skeletons, from St. John's River, Florida.

BLAKE, JAMES H. 1 *Scotophilus noctivagans*, from Cambridge; 5 specimens of *Hesperomys leucopus*, from Provincetown; 1 skeleton of *Hyperaodon bidens*, from North Dennis.

BRYANT, Capt. CHARLES. 2 fresh skins and two complete skeletons of the Northern Sea Bear (*Otaria Stelleri*); 6 fresh skins and 6 complete skeletons of the Northern Fur Seal (*Callorhinus ur-*

sinus) ; 1 fresh skin, a skull and a complete skeleton of the Walrus (*Trichechus rosmarus*), from Alaska.

GLEN, MRS. M. 1 *Condylura cristata* and 3 skins of Bats, from Cambridge.

HAYDEN, Dr. F. V. Box of skulls and other bones of *Bos americanus*, from the Laramie Plains.

HAYS, Dr. I. I. 1 skull and 2 complete skeletons of Seals, from Greenland.

LOCKWOOD, SAMUEL, Jr. 3 specimens, 3 species, from Fallsburg, N. Y. ; 5 specimens, 1 species, from Cambridge.

MARTIN, STEPHEN C. 1 skull of *Mesoplocodon sowerbyensis* ; 15 specimens, 4 species, in alcohol, from Nantucket.

RÆTTER, JOSEPH. 1 *Arvicola riparius*, from Cambridge.

By Exchange.

JARDIN DES PLANTES. 6 specimens, 6 species, skins.

Report on the Birds, by J. A. ALLEN.

During the past year the arrangement of the ornithological collection has considerably advanced. Some fifteen hundred North American skins and mounted birds received at the close of last year, and about nine hundred others received since, have been entered upon the general catalogue, and the entire North American collection of skins systematically arranged in the bird room. The condition of the alcoholic collection has also been thoroughly examined, and fresh alcohol added wherever it was needed. The North American birds preserved in alcohol have been entirely rearranged, the cataloguing completed and the specimens removed from the kegs and barrels, in which up to the present year they had been mainly stored, to glass bottles and stone jars. This portion of the collection now numbers above six thousand specimens, representing three hundred and seventy-two species, any specimen of which is perfectly accessible for examination. The South American collection is probably nearly as large, while there are also a large number of specimens similarly preserved from Europe, the East Indies, the Pacific Islands and Zanzibar. The whole number of birds

in the Museum is now not far from twenty thousand specimens, (excluding above thirteen hundred lots—four thousand specimens—embraced in the embryological series,) more than one-half of which are alcoholic. About eleven thousand two hundred are catalogued. The work of cataloguing and systematically arranging the alcoholic collection is comparatively slow, it requiring more than four times the amount of time to thus arrange a given number of alcoholic specimens that it does the same number of skins. It is expected, however, that during the coming year the South American lots will be finally arranged, and that before many months the entire alcoholic collection will be transferred to glass and stone vessels.

In the last report attention was called to the want of duplicate specimens for exchange, and, in respect to the water birds, the lack of specimens to properly represent many of the North American species in the reserve collection. Owing to certain unfavorable circumstances little has been done to supply this want, and the importance of providing for it is again urged. Through the addition during the present year of some seven hundred specimens of Florida birds, partly obtained by purchase and partly by the curator during a vacation trip to that State, the birds of Eastern North America are now in general well represented, while of some of the most interesting species the Museum contains very large and valuable suites.

The circular in reference to obtaining data concerning the geographical distribution of the birds of North America, issued by the Museum last year, has received gratifying attention. While the number of local lists received is not yet large, assurances that such aid will be forthcoming are not wanting. In addition to the list of Cuban birds, received from Dr. Gundlach, mentioned in the report of last year, a list of the birds of Buffalo, New York, with annotations, has been received from Mr. Charles Linclen, custodian of the Buffalo Natural History Society; a partial list of the birds of Clarkson, Ohio, from Mr. Thomas Hale; notes on the arrival of birds in spring at Richmond, Indiana, from Mr. L. B. Case, and an annotated list of the species found in the breeding season at Marshall, Michigan, from D. Darwin Hughes, Esq. An annotated list of the winter birds of East Florida, has been received from Mr. G. A. Boardman, and another from Mr. C. J. Maynard. I should also here

acknowledge the indebtedness of the Museum to the Rev. Thomas Marcy for very important assistance rendered by him in collecting in Florida.

The additions to this department, as to that of Mammals, aside from the Florida collections, have been small. In consequence of want of storage room for specimens, some of our correspondents have been invited to retain, for the present, their exchanges; but it is now hoped that we shall soon be able, not only to heartily welcome any additions, but to make some special effort to increase the ornithological collection. From the special interest attaching to Florida birds, I consider it fortunate that the Museum has been able to secure the greater part of the large collection made in that State last winter, by Mr. C. J. Maynard; which collection is more than ordinarily valuable from the specimens being accompanied with measurements and other notes made from the fresh specimens. It has been for some time known that Florida-born birds, of certain species, differ considerably, in certain characters, from others of the same species born in the northern States; but the collections made in Florida last winter, now in the Museum, reveal the fact that in all the species which range in the breeding season from the Canadas to Florida, the specimens born at these two widely separated localities differ from each other very considerably. The southern are not only the smaller, but they have generally larger, slenderer bills, and brighter and darker or more intense colors. The Florida collections hence afford, not only important material for investigating climatic variations, but very desirable material for exchanges. The invoice of one hundred and three species of skins of East India birds, a part of which are mounted, forms also an important addition.

Two of the five duplicate collections prepared last year, averaging about eighty species each, have been sent out in exchange, as will be seen by reference to the following schedule of additions and exchanges:—

By Donation.

ALLEN, J. A., and Rev. T. MARCY. (*Florida Expedition.*) 315 specimens, 80 species, skins; 40 specimens, 26 species, in alcohol; 112 specimens, 45 species, skulls and sternums; 1 egg of *Aramus giganteus*; all from East Florida.

BABCOCK, A. L. 4 specimens, 2 species, embryos in alcohol, from Sherborne.

BLAKE, JAMES H. 1 specimen of *Larus argentatus*, and one of *L. delawarensis*, fresh, from Provincetown.

CURTIS, FREDERICK. 1 nest of Chimney Swift.

GIBBON, Gen. JOHN. 3 sage cocks (*Centrocercus urophasianus*), fresh, from the Laramie Plains.

MANN, BENJ. P. 26 specimens, 5 species, embryos in alcohol, including 4 of *Cathartes atratus*, from South Carolina.

PERRY, Rev. JOHN B. Nests and eggs of 9 species, from Burlington, Vt.

By Exchange.

JARDIN DES PLANTES. 28 mounted specimens, 26 species, and 20 skins, 20 species, from Asia and Africa.

MAYNARD, C. J. 9 skins of *Ægiothus linarius*.

THEOBOLD, W. JR. 115 specimens, 103 species, skins, from the East Indies.

By Purchase.

278 specimens, 66 species, from East Florida. 142 specimens, 46 species, (chiefly rare or northern,) from different localities in New England.

Sent out in Exchange.

To C. J. MAYNARD, Newtonville, Mass. 9 specimens, 8 species, skins.

To Prof. WILLIAM SCHIMPER, Strasburg, 95 specimens, 73 species, skins.

To Dr. J. HAAST, Christchurch, New Zealand. 107 specimens, 90 species, skins.

Report on the Articulates, by DR. HAGEN.

The year 1869 has been an important one with respect to the entomological department of the Museum. The collections having reached a certain completeness, Professor Agassiz wished that they should be revised with reference to their permanent arrangement. For this purpose unusually large means, such as are not likely to be again needed in this department, were required. Our outfit for cabinets has cost about \$4,000. In this connection I ought to state that the pattern of the cases adopted

for this purpose by the Museum is so appropriate and convenient that it has already been borrowed for public and private collections, ours being considered by all as the best model.

The first object was to secure the whole collection against noxious and destructive insects. Next to this was a still more important work. The greater part of the collection was stored in separate boxes containing insects of different countries; but the Orders were often mixed, and it was necessary to ascertain the special locality to which every insect belonged and to label it accordingly. The value of every collection depends in a great degree upon the accuracy with which localities are given; and in the Museum of Comparative Zoölogy this has great importance in view of the peculiar and comprehensive scheme laid out by Professor Agassiz for its organization. The task was a laborious one, requiring much time and care in its details; a label was to be provided for every pinned insect, and it was the more difficult since it was impossible to have printed labels for every kind of insect, and even when printed they must be arranged and cut in a certain form and manner, while at the same time the different orders, families, and if possible the genera also, were to be separated. The work was delayed still more by the slow delivery of the new boxes. By the kind and efficient help of Messrs. Ed. Burgess and B. P. Mann the arrangement of the North American Lepidoptera and Coleoptera was completed at the end of August. It may also be said that the collection is now as far as possible secure against destructive insects or injury of any kind, as well as against errors concerning localities. I should add, in order to justify the expenditure for this object, that all attempts to make a cheaper kind of boxes than those used by us, proof against noxious insects by chemical preparations, have failed. In a Museum intending to preserve a standard collection permanently intact, they would be wholly ineffectual. The best made and most perfectly fitting boxes, and therefore the most expensive, are in the end the cheapest, considered with reference to the future development of the Museum.

In the further arrangement, the order of Lepidoptera was first considered, that order forming the greater part of the whole collection. The collection of European Lepidoptera was arranged

separately. It consists for the greater part of very fine and fresh specimens, in a superior condition, including between one-third and one-fourth of the described species of the Macro-Lepidoptera and one thirty-third of the Micro-Lepidoptera,—a small proportion, but in good preservation. Besides the specimens set aside for this purpose, the Museum possesses specimens enough to provide the general collection also with nearly all the species. Some are in very fine condition for public exhibition, which is indeed already begun, some boxes being actually arranged in the exhibition room. A more exact statement of the number of the European Lepidoptera possessed by the Museum, would be as follows:—For the Diurna, Crepuscularia, Bombyces, one-third; for the Nocturna and Geometrina, one-quarter; for the Tiniana, one-fiftieth; for Crambina and Pyralina, one-fifteenth; for Tortricina, one-forty-second of the known species. The identification of this portion of the collection is finished, and for the most part does not admit of doubt. The collection of North American Lepidoptera north of Mexico, like the European, has been provisionally separated from the whole, and is chiefly intended for the use of American students, and for purposes of exchange with foreign entomologists. This collection was arranged by Mr. E. Burgess, who began the work last December. His first care was to collect all the specimens together and place them by families in the new boxes. The collection thus arranged, filled about ninety boxes. He then began the systematic arrangement of the Rhopalocera, upon which he is still engaged. The Diurna and Crepuscularia are finished. This part of the collection, so far as arranged, contains only one-half of the described species. Good specimens of almost all the North American Lepidoptera, well set, with the locality carefully designated, are much needed. The Micros, in particular, are very poorly represented.

The general collection of the Lepidoptera is so far finished as to be placed in the new boxes, filling fourteen cabinets. The Diurna are farther revised, and the genera and species separated, some of them occasionally determined. All the rest are divided only according to families. For some families of the Diurna the proportionate number, in the possession of the Museum, was approximately ascertained. The Museum possesses of

Papilionidæ, Danaidæ, Pieridæ about one-fifth of the described species.

The collection of the American Coleoptera has been separately arranged, according to Dr. J. Le Conte's catalogue, by Mr. Benjamin P. Mann, during the past year. The work is finished so far as Dr. Le Conte's catalogue goes. Thirty-six boxes are already arranged. The remainder of the collection is provisionally divided in families and genera. This collection now contains only a small part of the known species. But further work in the general collection, and in those of Melsheimer and Ziegler, will add a considerable number of the rarer species belonging to the western part of the United States. The Carabidæ have been carefully studied and determined by Mr. Sprague; also a part of the Lamellicornia. There are in the Museum nearly one-half of the species of North American Carabidæ given in Dr. Le Conte's catalogue (417 species to 1,107 by Le Conte). The arrangement of the general collection of Coleoptera is completed for the Cincindelidæ and Carabidæ, filling thirty-six boxes. The same is true for the greater part of the Lamellicornia. The account of the Carabidæ shows that the collection contains one-tenth of the described species enumerated in the catalogue of Harold and Gemminger. The remainder are separated by families in the new boxes. The other orders are only separated by families in the new boxes, with the exception of a small portion of the Orthoptera, which are further separated and arranged.

The whole collection fills nearly eight hundred boxes. The whole work done as yet is very small, considering what remains to be done, and the scientific revision and determination of the species is of course only possible at present for a small portion. Mr. B. P. Mann has carefully identified the North American Catocalidæ, and stated the collection to be rich in species.

After careful consideration and by the advice of Dr. J. Le Conte, it has been resolved that the collection of Coleoptera of Melsheimer and Ziegler should no longer be kept separate, but should be incorporated in the above-named collection. The boxes containing them, far from being well made, have already endangered the collection. Under the circumstances its incorporation in the general collection seemed important; but every insect is labelled with "Melsh." or "Ziegl.," and with another

label agreeing with the former collection, so that in fact the integrity of both collections is preserved.

The collection representing the metamorphoses and all the different stages of the species is begun. The objects suitable for the purpose are taken out of the alcoholic collection, enclosed in glass tubes of a particular pattern, and closed in a manner used by me and found satisfactory in my own collection, for many years. The glass tubes, always labelled inside, are contained in eighteen boxes. Their systematic arrangement is partly completed, especially in some families of the Coleoptera.

The biological collection is partly arranged and fills twenty boxes, consisting chiefly of the nests of the Hymenoptera, the silk-producing Lepidoptera, the American galls and the insects injurious to trees. The splendid additions presented to the Museum by the celebrated Professor Ratzeburg, of Berlin, form a prominent and beautiful part of the collection. Some very fine specimens were collected by myself in the White Mountains. The materials contained in the Museum are comparatively rich. Some boxes are placed in the exhibition rooms.

The physiological collection consists as yet only of one box, with some beautiful specimens. The *Morpho* with the head of the caterpillar, is worthy to be remarked even in this general report.

The palæontological collection received a very considerable addition from specimens purchased from Dr. Krantz in Bonn, Prussia, belonging to the Jurassic schists of Solenhofen and to the Rhenish brown coal of Rott in the Siebengebirge. Most of them are types described and published in H. V. Meyers' *Palæontologica*, by the late Senator V. Heyden and myself. The Diptera, Coleoptera, and some Odonata form the principal insects of the lignites, the Orthoptera and Neuroptera of the Jurassic schists. One specimen of *Locusta speciosa* Germar is the finest and most beautiful yet found. I had seen it some years ago in Munich, but it was then too expensive to be secured. Some of the Odonata are really beautiful. The collection is arranged, labelled and exhibited in the window cases of the exhibition room.

The microscopical collection has a beginning in preparations made by myself during my entomological work at the Museum, employing for that object duplicates otherwise useless for study.

The object of this kind of work is chiefly as a preparation for further study in this direction, and for the use of students who wish to devote their time to like investigations. Chiefly for this purpose the writer of this Report has ordered and imported new French and German microscopes of a low-stand pattern, recognized in Europe as the most fitting for such work. Some of them, paid for many months ago, have not yet arrived; especially the Gundlach objective, noticed in German and English papers as the strongest now known. After careful examination and many test experiments I have nearly completed the necessary arrangements for securing as useful and at the same time as cheap a collection of instruments as possible, and I hope in a few months that I shall be able to furnish to students an extensive plan for microscopical study. The Museum will then be provided with American, French and German microscopes of the best kind and power, with working lenses, especially Prof. Bruecke's working lens, not hitherto known here; also different kinds of instruments for drawing by the microscope and the best test objects, as Nobert's newest test plates and Miller's greatest Diatom plates, imported especially for the instruction of students.

The Library of the Museum has received by purchase a very valuable addition in the entomological works belonging to the late Dr. Zimmermann, of S. Carolina, containing chiefly coleopterological books. It was thought more convenient to unite in the entomological room, in the Museum, all works belonging to this department, from the library of the Museum as well as those from the private library of Professor L. Agassiz and my own. They are arranged alphabetically and a separate catalogue is ready. The portion of this library relating to the insects of North America is set aside for students, and everything is done to make it hereafter as complete as possible.

The alcoholic collection is revised and in tolerable condition. Further progress in it was not possible for want of time.*

* After this Report had been handed in, Dr. Hagen received the gratifying intelligence that Baron d'Osten Sacken has presented to the Museum his whole collection of Galls, of Cynipidæ or Gall-producers and their parasites. The collection contains all the species thus far found in the United States, and is the more valuable because all are types described by the Baron in his excellent papers upon this matter in the Proceedings of the Philadelphia and Stettin Entomological Societies. There exists no collection in the world, so far as I know, so complete and so carefully worked out as this. As the Museum already possesses the types of American Galls described by the late Mr. B. Walsh, this gift from Baron d'Osten Sacken now gives unquestionable superiority to our collections in this important department of Natural History.

Report on the Condition and Prospects of the Department of Conchology, made Dec. 31, 1869, by JOHN G. ANTHONY.

Our last Report brought us to the close of the year 1868, and we have now to chronicle the operations of the department during the year about to close.

From the date of that report the policy which was then pursued has been steadily persisted in, so that instead of pressing our exchanges as formerly and constantly laboring to increase our large stock of Mollusks, we have preferred to work up materials already on hand.

The classification, arrangement and mounting of the specimens has enabled us to know our possessions and wants with more precision and prepared us to exchange with better judgment and greater profit to our collection. Our advance in this direction may be summed up in the statement that within the past twelve months we have added nine thousand two hundred and fifty mounted tablets to the seventeen thousand then on hand, so that now we have twenty-six thousand two hundred and fifty tablets, mounted with sixty-seven thousand seven hundred and forty-nine specimens of shells.

Of this number, twenty-two thousand four hundred and three tablets have been mounted with fifty-six thousand nine hundred and seventy-two specimens by the writer of this during the six years he has been connected with the Museum, and the remaining three thousand-eight hundred and forty-seven tablets have been added by the three female assistants, who under the policy recently adopted have been mostly employed in preparing the tablets, but who have also occasionally been allowed to mount the specimens, under proper supervision.

As might be expected, where so much time has been given to one object but little could be spared for others, and our exchanges have consequently been more or less neglected. Nevertheless we have not been altogether idle in that respect, and have to report twenty-four packages as having been received during the present year, containing one thousand one hundred and fifty-five species and twenty-one thousand one hundred and twenty specimens, while during the same period we have sent abroad fifteen packages containing two thousand four hundred and twenty-three species and seven thousand seven hundred

and seventeen specimens. This does not show a very large increase during the present term, but the accessions have been mainly of a very superior character. We cannot hope, with our large collection, to receive many new things, and it would be unwise to overburden ourselves with useless duplicates; hence it has been our constant aim to solicit such species only as were not already in our collection or but indifferently represented there, and this has also tended to limit the number received. Thus restricted, our increase has necessarily been slower but more useful, and we have had the pleasure of receiving several parcels of shells possessing no ordinary interest. Among these we may mention a package containing the most complete collection we have ever seen of the land shells found in the Madeira group, but few species being absent of all those which are known to occur there. These specimens were in a most excellent state of preservation, totally unlike the ordinary sub-fossil condition in which we so generally receive specimens from those islands; and the number was also considerable, being one hundred and forty-four species and four thousand four hundred and thirty specimens, all fluviatile and terrestrial. But one regret was felt in receiving this most beautiful and welcome addition to our collection, and that consisted in the fact that they came unannounced and unaccompanied by any letter or invoice through which the name of the donor could be with certainty determined, thus preventing us from making due acknowledgments to him for his valuable and timely present—it is one of the most complete additions made to our collection for many years.

Mr. J. A. Allen, the Ornithologist of the Museum, having for his health spent a period of last winter in the more genial climate of Florida, has contributed a valuable addition of freshwater shells from a portion of our country to which we have hitherto had very few opportunities of access.

With the consent of Professor Peirce, Superintendent of the Coast Survey, Count Pourtales has also deposited with us the results of dredgings made in the Gulf Stream. These dredgings are of a highly interesting character, bringing to light specimens of many species hitherto considered only to exist in a fossil condition, tending strongly towards a material change of opinion,

if not to a total reversal, of many ideas hitherto considered firmly settled in geology.

From Mons. Cailliaud, Director of the Museum at Nantes, we have received a fine collection, consisting principally of boring shells *in situ* and of African fluviatile shells collected by himself.

The Smithsonian Institution has sent us, through Mr. P. P. Carpenter, about three hundred and fifty species of shells, carefully named from type specimens in the Cumingian collection, which will not only be of considerable value in themselves, but enable us to identify and name correctly many species which we have in quantities from former collections, made in the Society and Sandwich Islands and elsewhere.

We are also indebted to many other sources for valuable additions,—to the Portland Society of Natural History for a fine contribution of our coast shells, to Dr. Hensche for his invoice of Prussian and other shells, and to Messrs. Mayo, Layard, Bryan, Coronado, Bayley, Hubbard, Theobald and Geale, for their several handsome and valuable contributions. To all these contributors we desire to express our sincere thanks for these and other kind favors received from them.

The work of arranging and cataloguing the collection is still going on, though this is necessarily a slow process, under the rules we have adopted, by which we place no species on the list which has not been mounted or about the name of which we have any serious doubt.

In terrestrial genera our most extensive genus is *Helix*, as established by the older writers. Of this we have considerably over thirteen hundred species, carefully named and mounted, and these we are now engaged in endeavoring to arrange and classify under new and better generic relations, the many attempts by others to make a proper arrangement having in most instances failed to commend themselves to our judgment. We have as yet made but little progress in this work, but propose during the coming year to make it the most prominent object of our labors. We have also made considerable progress during this term, in arranging the *Naiades* under several new genera, based mainly upon anatomical considerations, our large collections of *Unios*, *Anodons* and *Alasmodons*, in alcohol, affording us many facilities in this respect. We

have in these genera five hundred and twenty-seven species, mounted on two thousand one hundred and sixteen tablets, with five thousand eight hundred and ninety specimens, and for beauty and perfection in every respect, our collection of Naiades will compare most favorably with the best on this continent.

We are more deficient in marine shells, and the work of mounting and identification is less advanced in this part of the collection than in the terrestrial and fluviatile genera. The genera most perfectly worked up in marine forms are *Conus*, *Cypræa*, *Marginella*, *Voluta* and *Columbella*. Of *Conus* we have named one hundred and seventy species, of *Cypræa* over one hundred and fifty, and of *Marginella* over seventy species, all mounted on tablets. We trust that we shall be able during the coming year to get our marine shells more thoroughly worked up, and be prepared in our next report to give a better account of them.

In summing up the results of our present year's labors, we see no reason for discouragement. Our course has hitherto been steadily onward, and we hope to continue in the same direction, with an accelerated progress.

Report on the collection of Fossil Remains in general, by Professor N. S. SHALER, assistant in Palæontology.

During the past year the work of cataloguing the collections has been pushed as rapidly as possible, with such success that at the present time almost all the specimens have been secured against risk of displacement. The whole collection has been placed on racks so that there is no longer any difficulty in obtaining in a moment any specimen which may be sought. Considerable progress has been made in the work of zoölogical and stratigraphical arrangement; about one-half of our stores are now so far advanced that they are ready for that mechanical work which will fit them for exhibition on our shelves. Several persons have been employed in the work of cleaning the fossils during the past few months, so that it is only required that they be properly mounted on tablets to complete the work of preparation. Of the persons engaged in this work, three are young women, who have been constantly employed. They are paid by the hour,

the rates being the same adopted in our Public Library. This arrangement has proved most satisfactory, the work has been very carefully done, the patience and dexterity being in many cases most commendable. Three students in the College and Museum have been employed in doing the heavier work of cleaning and arranging; these young men have been able to give only the hours which could be spared from their studies, so that the aggregate labor has not been greater than that of one person continuously employed. The result of this labor has also been very satisfactory. After a good deal of experiment the precise means of displaying the specimens has been determined, and one person is now employed in mounting the specimens on the exhibition tablets. It is hoped that during the coming year we may be able to take the final step in the work with a large part of the collection.

Although but little money has been spent by the Museum, in the purchase or collection of fossils, the additions to the collection have been numerous and important. We acquired by purchase from Dr. Krantz, in Bonn, a very fine collection of fossil insects, from the lithographic slates of Solenhofen and brown coal of the Siebengebirge, most of the specimens being types from which the species were described, by Dr. Hagen and Senator von Heyden. Considerable effort has been made to extend our exchanges. With this intent a printed list of those species of American fossils which we could furnish in quantities for exchange, was sent to most of the scientific institutions and leading naturalists of Europe, with the statement that we would be glad to exchange these or other species, for recent or fossil species, or for works on natural history which might not be contained in our collection or library. Responses to this circular have already begun to arrive, and it will probably do much to extend our intercourse with other institutions. A similar catalogue of European fossils is now being prepared for circulation in the United States. About a dozen valuable collections have been received in exchange, in value many times greater than has ever been obtained from this source in any one year before.

During the past summer the assistant in charge of the department spent two months in making a careful examination of the important deposit of Big Bone Lick, in Kentucky. The

excavations made at this point were quite successful, affording a large amount of material for determining the association of the extinct mammalia of the West and the relation of the recent to this fossil fauna. The expenses of these excavations were borne in part by an ever generous friend of the Museum, Mr. J. M. Barnard, and in part by the assistant himself. Arrangements have been made to continue these excavations during the coming summer. In addition to the materials obtained, much information was gained, which it is hoped will make these excavations even more successful, during the coming summer, than they were during the last. The Museum is especially indebted to Mr. Barnard for the assistance without which these rather costly excavations would not have been undertaken, and to Mr. C. A. McLaughlin, the owner of the ground on which the excavations were carried on, for the privilege of making the researches, and for numerous courtesies, while the work was being done. In addition to this favor Mr. McLaughlin has generously given to the Museum a number of valuable fragments of a mastodon and a mammoth skeleton, now on exhibition in the rooms of the Museum. A full report of the results obtained from these researches, will be published in a forthcoming number of the Bulletin of the Museum.

The course of lectures and the systematic instruction in Zoölogy and Palæontology, begun during the past year, has been continued through both terms of the present year. This teaching has afforded to those who were desirous of obtaining special training in these sciences an opportunity of pursuing their studies with the necessary guidance and an abundant supply of the requisite materials. The plan of the course covers two collegiate years, with four hours instruction per week. In addition to this specified instruction, those who were pursuing this course have been allowed to spend their spare time in the Museum and have received such attention as their studies might require. The attendance on these courses of instruction, although never large, has been such as indicated that they supplied a want in the University. Since their organization forty persons have pursued a more or less extensive system of studies in the Museum, taking these lectures and practical exercises as the basis of their work. This does not include a number who have attended the lectures but have taken no part in the practical in-

struction. Among those who have attended this teaching were teachers from five different collegiate institutions.

In order to render the instruction as effective as possible, there should be separated from the collections of the Museum a lot of specimens for the especial use of students. Owing to the care which has generally been taken to secure large amounts of materials in making collections for the Museum, it will be possible to make a good students' collection without encroaching upon that part of our stores which must be reserved for scientific purposes.

In addition to the instruction given in the Museum, an opportunity has been given to the students of the University who were attending the lectures of the Curator of the Museum on geology, as well as the special students of the course of instruction before described, to learn something of practical field geology. On the Saturdays in October and November excursions were made to a number of points of interest in the vicinity of Boston. Coming just after the Saturday lecture on geology, these excursions have been numerous attended and have served to supplement the geological instruction.

The teaching power of the Museum, as well as all its other functions, is now hampered by want of room. The hall, originally designed for a lecture-room alone, has necessarily been made to serve as a store-room and work-room, and has besides to afford quarters to the special students. This has made it impossible at times to afford a chance to work to those who sought instruction. It will be possible when the contemplated addition to the Museum is effected to have a set of work-rooms fitted up at a small expense, which will give accommodations for one hundred students engaged in laboratory work. It seems likely that under the new system of elective studies in the College we shall soon have at least that number seeking instruction in the Museum in the several departments of Natural History. At present, we have not space in which to accommodate a single additional student.

The most pressing need in this department is larger supplies of American fossils. One thousand dollars a year would enable us to keep one collector constantly in the field, and the duplicates obtained from him would enable us to exchange for European fossils worth far more than all his collections cost.

List of persons to whom the thanks of the Museum are due for donations of fossils:—

ALLEN, J. A. Fossils from St. John's River, Florida.

BARNARD, J. M. For one-half the expenses of excavations for fossils, made at Big Bone Lick.

HODGE, Gen. G. B., of Newport, Ky. A valuable specimen of crinoid.

MARTIN, S. C., Student in the Museum. A lot of fossils.

McLAUGHLIN, C. A., of Covington, Ky. A lot of bones and teeth of a mastodon and a mammoth.

PERRY, J. B., Assistant in the Museum. 17 boxes, 148 specimens of Palæozoic fossils and 850 of Pleistocene fossils.

POURTALES, L. F. de. A lot of fossils, from Springfield, Illinois.

SHALER, N. S., Assistant in the Museum. Share in the expense of collections made at Big Bone Lick and a collection of Silurian fossils from Kentucky.

WYMAN, Prof. JEFFRIES. A lot of fossil mollusca, from Florida.

Report on the Tertiary Fossils, by Rev. J. B. PERRY, Assistant in Palæontology.

As the first of January is near at hand, it becomes my duty to report generally upon what I have done, and more in particular upon the advancement which has been made, during the year, in the arrangement of the fossil collections entrusted to my care. Presuming that there is an acquaintance with the condition of things twelve months ago, I proceed to touch upon such points of interest as are calculated to show the changes wrought, and the improvements effected since that time.

First of all, I am to indicate the work carried on and the progress achieved in the systematic disposition of the Tertiary fossils.

The last annual Report gives an account of the initiatory steps taken with a view to the arrangement of the Gasteropoda of the Tertiary era, and of the plan laid out for further investigations upon them and upon the other Cainozoic remains. Remembering what is there said, one can readily appreciate the character of the undertaking, and the aims which should be kept constantly in mind as a guiding light. These aims have

been made prominent throughout the year, and in consonance with them the work has been pushed forward with as much vigor as circumstances have allowed.

Deserving of special notice, and of great importance as respects the security of the collections, is the Museum system of cataloguing. It is the design to enter all the specimens received into the Institution on blank sheets expressly prepared for the purpose, and which, for convenience of reference, are to be bound when the work is completed. Each entry bears a definite number, and is intended to comprise the generic and specific designation of the parcel catalogued, the name of the person who described the species, of the place at which the collection was made, and its geological horizon; also that of the collector, followed by an indication of the mode in which the specimens were obtained, whether by donation, purchase, or exchange, the donor's name, when known, being distinctly written, with a brief record of the number and condition of the individual examples. Of the Tertiary Gasteropods, more than ten thousand such lots have been separately entered during the past year. These ten thousand parcels contain some seventy thousand individual specimens. According to a rough estimate, the number already thus catalogued, comprises about four-fifths of the Cainozoic Gasteropoda belonging to the Museum collections. In order to give some impression of the work done in this direction, it may be added that each entry implies a careful examination of all the parcel contains, specimen by specimen, and that the sheets of the catalogue, as thus far made out, are sufficient to form four quarto volumes of good size.

Upon a considerable portion of the specimens, of which a permanent record has been in this wise made, the catalogue numbers have been duly placed, by young ladies working under my direction, while all the remaining specimens are in a way to receive their appropriate numbers, with as much rapidity as the care requisite to accuracy will warrant. It may be thus seen at a glance, that this part of the Palæontological treasures of the Museum is securely guarded against the dangers to which it would be otherwise exposed, from occasional mishaps or accidental displacements. Indeed, should all the specimens be thrown into a heap, turned upside down, or otherwise mixed, if not broken or destroyed by the process, being numbered they would

be, for the most part capable, by means of the catalogue, of restoration to their true position. They could be made to bear witness as before in respect to classification, geographical distribution and chronologic succession, to say nothing of all the other important points, on which their testimony might be invoked.

I have also been busily engaged pushing forward the systematic arrangement of the different parts of the collection, as time has been at my disposal or opportunity has allowed. The aim has been to group the specimens as nature dictates, irrespective of much that is arbitrary, if not positively false, in the usual modes of arrangement, according to the prevalent systematic nomenclature. Meanwhile what has been done in the past, and what others are now doing, has not been overlooked. Great pains have been taken to search out, so far as the means have been at my disposal, the first authentic designation and figuring of each species. The data in this way obtained have been usually either noted with brevity or entered more at large on appropriate labels. The work has been thus carried on by a combined study at once of specimens themselves and of what others have done, in order both that every past investigator may receive his due, and that whatever of progress is made in the present may be organically linked with the valid results reached by those who have gone before,—so linked that there shall be, not a mere juxtaposition of the old and the new, but an interstitial growth in our knowledge of the organic world.

At the same time the collection has been greatly improved in other respects. By the aid of assistants, many of the specimens have been thoroughly cleaned. By this means, and in other ways, they have been put in readiness for mounting, so far as they need to be by such manual processes. The mounting of the specimens upon tablets has been thus far purposely deferred, but a very large number of tablets are ready to receive them. Other preliminary matters are further advanced. In the working up of a group,—in the selection of specimens for the systematic, the faunal and the chronologic, to say nothing of any other collection or collections to be formed,—it is of great advantage to have all the material at hand and under the eye. Indeed, when one has not such a command of his material it is almost impossible for him to make as choice a selection, or to

do his work, so well as he could wish and otherwise might. In short, every day which is spent in the systematic arrangement of the fossils puts them in a better condition for mounting.

Another work has been begun, to which I briefly refer. In order to the harmonious advancement of the several sections of palæontological work, I entered, in August last, at the suggestion of Professor Agassiz, upon the systematic arrangement of the fossil Corals of the Museum. A considerable number, about thirty-one hundred parcels of these specimens, had been already catalogued and numbered, either by my colleague, Professor Shaler, or under his direction. Still other parcels, owing to the pressure of the moment, had been simply registered by numbers. Since that time, many additional entries have been made; while appropriate numbers have been put upon all the specimens thus entered, which had not before received them. The parcels thus far catalogued, amount to six thousand four hundred and sixty-two. There are others yet to be entered, though the number cannot be very large. Thus the greater part of this section of the Museum treasures has been placed in a secure condition. But, in connection with the numbering of specimens, other work has been done. Since September, there has been constantly going on, and there is still in active progress, the process of cleaning these corals, and preparing them in due time to be mounted on tablets. There have been thus far prepared all those of the Tertiary times, and a portion of those of the Cretaceous, while a beginning has been made upon those of the Lower Silurian age. In addition to this preparation for mounting, it is very desirable that sections should be made of a considerable number of the specimens, in order that there may be a better exhibition of the structure and other peculiarities of these interesting forms of life.

In entering upon the arrangement and study of this portion, or of these portions, of the animal kingdom, it was my aim, at the start, to arrange the multitudinous collections according to their geological horizons. This was done by bringing all the specimens of each different age together, so far as I could make them out, in divisions, answering to the several successive horizons between the Primordial and the latest Tertiary. Of course, perfect exactness could not be secured at once, from

the imperfection of labels and other kindred defects. The work was accordingly done somewhat roughly, though the best the circumstances would allow, the determination of many details being left gradually to appear as the fruit of other labor and more critical examinations.

My next aim was the separation of the organic forms of the several horizons, according to faunas. In other words, I endeavored to throw the fossils of each geologic stage into divisions answering to the localities or basins, to which they geographically belong, and thus into faunal sections. This task also was accomplished, at first only in an approximative manner, the full working out of many points being left to come as the matured result of future and more detailed investigations.

A third aim all the while had in mind, and carried out by degrees, involved the separation of each faunal division into minor divisions, accordingly as the specimens belong to the class of Polyps, of Acalephs, or of Bryozoa. This work has been carried forward with a good degree of success; it is, however, as yet, far from complete, there being up to the present time, much doubt whether given groups be Polypian, Acalephian, or Bryozoan Corals; in other words, whether they should be systematically arranged as Polyps, Acalephs, or Mollusks.

Another aim which has been kept prominently in view, has reference to the accurate recognition and bringing together of all specimens of the same species, as well as the arrangement of them in groups according to their affinities. Of course, this work involves the separating from each group of all alien specimens, and their removal to other circles to which they are akin. In connection with this aim, not a little care has been taken to verify the systematic names inscribed on the labels, so far as any appear; also to discover and record the earliest distinctive designation, description and figure of each species. This task, indeed, has been entered upon, and carried forward with great painstaking in some portions of the collection. While, however, much has been done in this direction, the work as a whole, is only just begun, and will require an immense amount of labor and patient investigation, in order to its satisfactory completion. It must thus be evident that not a little preliminary work has been already accomplished on the fossil corals,—work which is necessary in order that they may be at once safe, and studied

with advantage. The collection being arranged according to the method indicated, it becomes easy, not only to turn to a given group, but also on a moment's notice, to lay one's hand on any species or particular fossil in the group. Such an arrangement accordingly renders the consultation of the collection a pleasure rather than a task; it prepares the way for further and more critical work; thus it invites and lures on to original investigation.

A few words should be next devoted to matters outside of the systematic arrangement of fossils.

In the first place, lectures have been delivered. The course on the Geology of Vermont, which was already begun at the time of the preparation of the last Report, was duly completed during the early portion of the year. Another course, on the Geological History of the Primordial Era, is now in progress. It was commenced in October last; it is to be completed during the spring term. The aim of this course of instruction is the detailed account of all that is up to this time known, at once of the oldest sedimentary rocks, and of their included organic forms, which stand as monuments of the earliest well-accredited life of the globe.

Again, material has been prepared for exchanges. As the systematic arrangement of fossils has gone on, spare specimens, not needed in the Museum collections, have been gradually eliminated and placed by themselves. These specimens have been carefully cleaned, examined and determined; or, if there had been a previous determination of the name, it has been duly verified and authenticated. As thus worked up, these specimens have been properly labelled and are in readiness for collateral uses. As must be evident, the amount of such surplus material is in a way to be steadily and greatly increased, in proportion as the work of classification goes on. There are accordingly now on hand and in readiness, or are likely to be in due time, specimens in large numbers, as well for exchanges as for distribution, upon proper conditions, among the various institutions of learning, not only in this Commonwealth but throughout the country. These specimens, as serving to characterize the several different stages of geologic history, must be of great benefit in giving broader, more definite and better

views than have always prevailed of the formation and of the progressive steps in the advancement of our planet.

Once more, as it may be proper to remark, specimens in considerable number have been brought to light and put in a more determinate shape in connection with the preliminary work on the Museum collections. The soil removed from many of the Tertiary specimens abounds in minute shells, which are of great value as showing more fully the actual life of the times to which they belong. These specimens have been to a great extent catalogued, numbered and disposed in vials for safety. They are now ready to take their places, and become permanently incorporated in the several Museum collections which are in process of formation. They consist in part of the young of species already well known in their mature forms; in part of adult individuals of species which never attain to a large size, and partly of specimens probably both young and adult, representing groups heretofore undescribed. The sands and clays also have been as carefully preserved and accurately labelled, as if they contained gold. And they do contain that which is more precious than gold to the naturalist; they abound in Foraminifera and other low forms of life, and thus will afford abundant material, and in due time a rich harvest, for the microscopist.

The collection of specimens which has been gradually accumulating on my hands during the last fifteen years, I present to the Museum. In addition to a small variety of recent land and fresh-water shells and a considerable number of mineralogical specimens, it consists for the most part of fossils from various parts of the country, more especially characteristic of the different horizons of Palæozoic and Tertiary times.

For information respecting exchanges, and other additions to the Palæontological stores of the institution, reference may be made to the report of Mr. Shaler.

In closing this Report, I desire to refer to the efficient aid I have received from the several young ladies who have acted as my assistants. While receiving benefit themselves, becoming imbued with the spirit of the institution, and acquiring a taste for Natural History, with some knowledge of it, they have enabled me to devote more time than would have else been possible to critical investigations intimately and necessarily connected with the systematic arrangement of the collections.

Our thus working together, as it is thought, has been a means of good to them and of economy to the Museum. Accordingly, in reviewing the labors of the year, I feel that something has been done, a little progress made, in the work under my hands, toward the realization of the purposes of the Director. All things considered, and so far as I can judge of other departments from what has been accomplished in my own field of work, the prospects of the institution, as intended to carry out the high ends and to reach the grand scientific results implied in a Zoölogical Museum, were never brighter than they are to-day.

Report on the Collection of Fossil Vertebrates, by Dr.
G. A. MACK.

I arrived at Cambridge, May, 1869, having come to this country in order to take charge of the collection of fossil Vertebrates in the Museum of Comparative Zoölogy. After my arrival I found it absolutely necessary to submit those fossils which had been collected for years past, but which had never been arranged according to a scientific classification, to a close investigation. I began with the fossil Mammalia, and endeavored to collect the various materials in this department, scattered over the Museum, in various cases and boxes. Nearly all of these fossil Mammalia, that is, bone by bone, tooth by tooth, I have now determined, labelled and catalogued. I am happy to be able to report that I have found among this mass of fossils a larger number of species and genera than I at first expected to find. Nevertheless, there exist certain gaps in this department of the Museum, which, however, I hope to be enabled to supply, during the ensuing year, through the assistance of my friends in Europe.

The following list exhibits what I have so far determined:—

<i>Elephas primigenius</i> Blumenb.,	.	.	.	.	20 specimens.
<i>Mastodon angustidens</i> Cuv.,	.	.	.	.	30 "
<i>Mastodon longirostris</i> Kaup,	.	.	.	.	2 "
<i>Mastodon giganteus</i> Cuv.,	.	.	.	.	6 "
<i>Rhinoceros tichorhinus</i> Cuv.,	.	.	.	.	33 "
<i>Rhinoceros incisivus</i> Cuv.,	.	.	.	.	26 "
<i>Rhinoceros leptorhinus</i> Cuv.,	.	.	.	.	6 "
<i>Rhinoceros Steinheimensis</i> Jäger,	.	.	.	.	9 "

<i>Rhinoceros Schleiermacheri</i> Kaup,	3 specimens.
<i>Tapirus priscus</i> Kaup,	2 "
<i>Tapirus arvernensis</i> Croiz. et Job.,	1 "
<i>Lophiodon parisiensis</i> Gerv.,	24 "
<i>Lophiodon Duvalii</i> Pomel,	1 "
<i>Palaeotherium magnum</i> Cuv.,	4 "
<i>Palaeotherium medium</i> Cuv.,	10 "
<i>Palaeotherium minus</i> Cuv.,	15 "
<i>Palaeotherium curtum</i> Cuv.,	14 "
<i>Palaeotherium aurelianense</i> Cuv.,	10 "
<i>Palaeotherium crassum</i> Cuv.,	3 "
<i>Palaeotherium Schinzii</i> H. v. Meyer,	1 "
<i>Anchitherium Bairdii</i> Leidy,	2 "
<i>Hippotherium gracile</i> Kaup,	16 "
<i>Equus fossilis</i> Cuv.,	110 "
<i>Siderotherium</i> Jäger,	1 sp.
<i>Hippopotamus major</i> Cuv.,	7 specimens.
<i>Choeropsis liberiensis</i> Leidy,	1 "
<i>Sus palaeochærus</i> Kaup,	18 "
<i>Choeropotamus parisiensis</i> Cuv.,	1 "
<i>Hyopotamus porcinus</i> Gerv.,	1 "
<i>Anthracotheium magnum</i> Cuv.,	1 "
<i>Anthracotheium velaunum</i> Cuv.,	5 "
<i>Anthracotheium alsaticum</i> Cuv.,	2 "
<i>Hyracotherium siderolithicum</i> Pictet,	10 "
<i>Rhagatherium valdense</i> Pictet,	7 "
<i>Cainotherium</i> Brav., (<i>Oplotherium</i> Laizer et Parieu,)	1 "
<i>Anoplotherium commune</i> Cuv.,	10 "
<i>Chalicotherium Goldfussi</i> Kaup,	7 "
<i>Xiphodon gracilis</i> Cuv.,	13 "
<i>Dichobune Campichii</i> Pictet,	3 "
<i>Cervus fossilis</i> Cuv.,	23 "
<i>Cervus furcatus</i> Hensel,	5 "
<i>Cervus</i> (<i>Palaeomeryx</i>) <i>minor</i> H. v. Meyer,	2 "
<i>Dorcatherium</i> Geoffr.,	4 "
<i>Bos primigenius</i> Bojanus,	50 "
<i>Bos priscus</i> Bojan.,	5 "
<i>Ursus spelæus</i> Blumenb.,	40 "
<i>Dinotherium giganteum</i> Kaup,	6 "

Besides the work above mentioned, I have begun to arrange the skeletons stored in the attic. From what I can judge the

collection of skulls in particular is a very large one. But as it is necessary for the study of fossil Mammalia, to have a collection of the skulls of the now living Mammals, at different ages, I have taken the necessary steps, in this direction, with regard to our domestic animals. During the ensuing year I hope to make such a collection.

Report on the Library, by DR. F. R. STÄHLI.

During the winter of 1868-9 I have examined the Library of the Museum and compared the books on the shelves with the shelf catalogues as well as with the card catalogue, marking their respective places in pencil on the cards. I did not find many books missing, but many misplaced, some being even in the wrong alcoves, while a good many had never been entered in any of the catalogues. My first work was to replace them and to complete the existing catalogue of accessions.

In order to make the library more useful, as well as to avoid misplacement of books, as much as possible, I was directed to rearrange the library, and to make fewer divisions and subdivisions; and to place the books in alphabetical order in the eight or ten large classes to which they belong, according to their contents. At the same time a general catalogue, according to this arrangement of books is in preparation, and will be completed in such a way as to allow any future accessions to the library to be easily entered in their proper places. It will be also provided with a general register of topics and authors, with cross references and references to the actual place on the shelves. Any book may in future easily be found by means of this catalogue.

During the year 1869, the valuable library of the late Dr. Zimmermann has been added to our collection, consisting of two hundred and seventy-three volumes, and two hundred pamphlets, all on entomology. A large number of volumes and pamphlets have also been added by Professor Agassiz, and Mr. Alexander Agassiz. The latter will complete sets of valuable works for the Museum during his stay in Europe. Our exchanges also have increased considerably. Of these I shall be able to give a full account in the next report. We have also

been indebted to various friends of the Museum for works of interest and value. Such gifts are always received thankfully.

The increase of the collection from January 1, to December 31, 1869, has been five hundred and fifty-one volumes and six hundred and two pamphlets. The exact number of books belonging to the library I am not prepared to give before the full catalogue is ready for use. The last number on our list of additions is three thousand nine hundred and seventy-five. I estimate the full aggregate at somewhat over eight thousand volumes and pamphlets.

Desirous of knowing as accurately as possible the present condition of the collection of Fishes, I directed Mr. Lockwood to count the glass jars already put up with specimens in alcohol. He reports that there are 2,842 in the Exhibition rooms, 7,203 in the work rooms, and 5,197 in the cellar,—altogether, 15,242; say fifteen thousand two hundred and forty-two jars, of all sizes, from the smallest, three inches high by one inch in diameter, to the largest, three feet high by nine inches in diameter, containing each from one to fifty and more specimens, and occasionally even several hundreds. And yet this is by no means half of the collection. The rest remains for the present piled up in tanks, barrels, kegs, cans, earthen jars and other vessels.

L. AGASSIZ.

[B.]

TRUSTEES OF THE MUSEUM OF COMPARATIVE ZOOLOGY, 1870.

THE GOVERNOR OF THE COMMONWEALTH,	WILLIAM CLAFLIN.
THE LIEUTENANT-GOVERNOR,	JOSEPH TUCKER.
THE PRESIDENT OF THE SENATE,	HORACE H. COOLIDGE.
THE SPEAKER OF THE HOUSE OF REPRESENTATIVES,	HARVEY JEWELL.
THE SECRETARY OF THE BOARD OF EDUCATION,	JOSEPH WHITE.
THE CHIEF JUSTICE OF THE SUPREME JUDICIAL COURT,	REUBEN A. CHAPMAN.

LOUIS AGASSIZ. THEODORE LYMAN.

JAMES WALKER.	JAMES LAWRENCE.
NATHANIEL THAYER.	C. W. FREELAND.
SAMUEL HOOPER.	SAMUEL ELIOT.
MARTIN BRIMMER.	

OFFICERS OF THE MUSEUM OF COMPARATIVE ZOOLOGY FOR 1870.

His Excellency WILLIAM CLAFLIN, Governor of the Commonwealth,
President.

THEODORE LYMAN, *Treasurer and Secretary pro tem.*

LOUIS AGASSIZ, *Director of the Museum.*

SAMUEL HOOPER, JOSEPH WHITE, NATHANIEL THAYER, JAMES LAWRENCE, *Committee on Finance.*

LOUIS AGASSIZ, JAMES WALKER, SAMUEL ELIOT, CHARLES W. FREELAND, *Committee on the Museum.*

